Express Mail No.: EL983328618US Date of Deposit: March 17, 2004

APPLICATION
FOR UNITED STATES LETTERS PATENT

FOR

SLIDING GATE VALVE

Inventor: Romanus Aniekezie Ngene-Igwe

Attorneys: Standley Law Group LLP
Attention: Roger A. Gilcrest
495 Metro Place South
Suite 210
Dublin, Ohio 43017-5319
Telephone: (614) 792-5555
Fax: (614) 792-5536
E-mail: rgilcrest@standleyllp.com

SLIDING GATE VALVE

Inventor: Romanus Aniekezie Ngene-Igwe

BACKGROUND AND SUMMARY OF THE INVENTION

[0001] The present invention relates to a gate valve, a sealing gasket for the valve, and a method of assembling the valve. More specifically, the present invention relates to a sliding gate valve such as may be used to govern the flow of a fluid such as a liquid or a gas. Example fluids suitable for use with the valve of the present invention include water, air, or oxygen. The fluids may or may not be pressurized as the valve of the present invention provides a seal against leakage that is not dependent upon a pressure differential. Typical installations for the valve of the present invention include, but are not limited to, household water supply systems, laboratory environments, and industrial settings.

[0002] The present invention is a sliding gate valve that may be comprised of a valve body having an inlet and an outlet, a cavity extending longitudinally through at least a portion of the valve body, a gate that is slidably moveable within the cavity, and at least one sealing gasket providing a seal between the gate and the cavity. Flow of a fluid through the valve is typically from an inlet to an outlet. Typically, the flow is generally transverse to the longitudinally extending cavity of the valve wherein the slidably movable gate can move to either an open or a closed position. Preferably, the sliding gate valve of the present invention is provided with a gate having a blocking portion and a conduit portion. Typically, flow through the valve does not occur if the blocking portion of the gate is aligned between the inlet and outlet of the valve.

Typically, flow through the valve is able to occur if the conduit portion of the valve is aligned between the inlet and outlet of the valve.

[0003] The sealing gasket of the present invention discourages unintended releases of a fluid from the valve of the present invention. The sealing gasket provides a seal between a portion of the sliding gate and a portion of the cavity of the valve body. The sealing gasket may be a typical o-ring, such as an o-ring having a round cross-section. The sealing gasket of the present invention may be comprised of two separate sealing devices, such as a pair of concentric o-rings. In this embodiment, one of the o-rings would provide a seal between the cavity of the valve body and the perimeter of the conduit portion of the gate. The second o-ring would provide a seal between the cavity of the valve body and a perimeter surrounding the conduit portion and the blocking portion of the gate. In this manner, an unintended release of fluid from the valve of the present invention is discouraged, even as the position of the gate is slidably moved in the cavity between an open position and a closed position.

[0004] Preferred embodiments of the valve of the present invention may be comprised of a groove on a surface of the cavity adapted to receive at least a portion of the sealing gasket. Alternatively, embodiments of the valve of the present invention may be comprised of a groove on a surface of the gate that is adapted to receive at least a portion of the sealing gasket. A sealing gasket in either position would govern the seal between an opposing surface on the gate or the cavity, respectively. In addition, alternative embodiments of the present invention may have a second sealing gasket on a second surface of the cavity or the gate. This second sealing gasket would be positioned to govern a seal between a second opposing surface on the gate or the

cavity, respectively. In addition, the second surface of the cavity or the gate may also be comprised of a groove adapted to receive at least a portion of the sealing gasket.

[0005] Alternative embodiments of the present invention may utilize one sealing gasket to produce a seal between a gate surface and its opposing cavity surface. A second sealing gasket may be used on the opposite side of the gate or cavity in order to produce a seal between its opposing cavity surface or gate surface, respectively. The singular sealing gasket in this embodiment may be comprised of a circular portion connected to at least one straight portion. Typically, the circular portion would extend around a perimeter of the conduit portion of the gate. An alternative embodiment provides for a sealing gasket comprised of a circular portion, at least one straight portion connected to the circular portion and a curved portion connected to the straight portion. Another alternative embodiment provides for a sealing gasket comprised of a circular portion, at least one straight portion connected to the circular portion and a substantially semicircular portion connected to the straight portion. Another alternative embodiment of the present invention provides for a sealing gasket comprised of a circular portion, at least one straight portion connected to the circular portion, at least one additional straight portion connected to the circular portion and a substantially semicircular portion having a first end and a second end. In this embodiment, the straight portions are tangential to the circular portion at their respective connections to the circular portion; in addition, the two straight portions are parallel. Additionally, the ends of the two straight portions are connected to opposite ends of the substantially semicircular portion.

[0006] Another embodiment of the sealing gasket of the present invention provides for a gasket comprised of a circular portion; first connector and second connector portions, each connected to the circular portion at their respective first ends; and a substantially curved portion having ends that are connected to one each of the second ends of the first and second connector portions. Another embodiment provides for a sealing gasket to surround both the perimeter of the conduit portion of the gate and the perimeter of the blocking portion. This embodiment is preferably a one-piece gasket that may have a portion of the gasket intended to isolate the respective perimeters of the conduit and the blocking portions. This sealing gasket may be comprised of any combination of curved or straight portions. For example, a sealing gasket of the present invention may be comprised of straight portions producing a shape resembling a blocked numeral eight. Alternatively, a sealing gasket may be comprised of circular portions sharing a common tangential border, thus resembling a pair of connected circles.

[0007] Any of the sealing gaskets of the present invention may be comprised of a material suitable for a use of the valve. For example, certain materials are more resistant to degradation in the presence of petroleum-based products. Examples of materials that may comprise the sealing gasket of the present invention include, but are not limited to: neoprene, rubber, isoprene, Teflon ®, nitrile, silicone, fluoroelastomer such as Viton ®, EPDM, EPM, styrene-butadiene, butyl, and CSM such as Hypalon ® elastomer.

[0008] Portions of the sliding gate valve, such as the valve body and the gate, may be comprised of a material suitable for a particular use of the valve. As mentioned

above, certain materials are more resistant to degradation in the presence of petroleum-based products. Examples of materials that may comprise the valve body or the gate of the present invention include, but are not limited to: plastic, PVC, CPVC, ABS plastic, polypropylene, polyethylene, metal, copper, aluminum, stainless steel, cast iron, and other typical piping and plumbing materials. The materials used for portions of the sliding gate valve may be manufactured using typical methods such as injection molding, casting, machine milling, and shaping.

[0009] Additionally, the valve may be comprised of at least one post operatively attached to an end of the sliding gate. If the valve has two posts, preferably the posts are attached to opposite ends of the gate. Typically, the posts may be used to move the gate between the open and closed positions for the valve. A post may additionally comprise an indicator of the position of an attached gate as an indicator of an open or closed valve. In addition, a post may be comprised of an end cap that may include an indicator of the gate position as an indicator of an open or closed valve. For example, a post or an end cap may include markings or printing of symbols or text on that element. Alternatively, a post or end cap may be colored to indicate a gate position. For example, a post or end cap may be colored green or red as an indicator of an open valve or closed valve, respectively.

[0010] The inlet and outlet of the valve of the present invention may be comprised of any typical pipe connection. Exemplary pipe connections include, but are not limited to: mechanical connections, threaded connections, sockets, Victaulic ®, flanges, welded connections, glued connections, compression fittings, banded

connections, swaged flangeless connections, hydraulic connections, and other plumbing connections.

[0011] A method of assembling an exemplary valve of the present invention is facilitated by two posts that are connected to opposing ends of a gate. The preferred gate of this example would be comprised of a pair of posts having different sizes and/or shapes. In this example, the valve body is additionally comprised of an aperture in the valve body that extends into the cavity allowing for the slidable assembly of the gate into the cavity. This aperture may be sealed with a cap or other similar device so that the sealed cavity secures the gate of the valve during its movement between an open or closed position. Preferably, the cap has an opening sized so as to provide a complementary fit for only one of the posts attached to the gate. Near an opposite end of the cavity, a second opening is provided that provides a complementary fit for the other post attached to the gate. During assembly, the gate is preferably installed by sliding it in a direction generally aligned with the longitudinal length of the cavity. Then, the cap or other sealing assembly is used to seal the aperture of the cavity. A correctly installed gate would have each of the posts on the gate installed in their respective complementary sized openings. As a result, the gate would be properly positioned for movement within the cavity that would preferably correspond with any exterior markings on the valve that indicate an open or closed state. In addition, by observation of the posts properly placed into complementary sized openings, the valve may be identified as having been properly assembled in the absence of any markings.

[0012] Alternatives to the different sized or shaped posts of an example embodiment of the present invention provide for a first post being smaller than a second

post or a first post having a different cross-sectional shape than a second post. In this manner the method of assembly may be further specified by the use of the different posts. For example, if a first complementary sized opening near an end of the cavity - that is sized to fit a first post on the gate - is smaller than a second post on the gate; the second post will not fit into the first complementary sized opening. As a result, the proper assembly of the valve is dictated by requiring a reversal of the gate so that the properly fitted first post will be placed into the first complementary sized opening. Then, the cap or other sealing device can be placed over the aperture in the valve body. In turn, the second larger post will be properly accommodated in a second complementary sized opening in the cap, thus producing a properly assembled embodiment of the sliding gate valve of the present invention.

[0013] An alternative method of assembly of the valve of the present invention provides for the assembly of two portions of a valve body formerly separated in the vicinity of the cavity of the valve to allow for installation of the gate. Preferably, the former separation between the two portions of the valve body would not be in the area of a sealing surface between the cavity and the gate. An exemplary embodiment of the valve of the present invention assembled by this method may use two nearly symmetrical portions of the valve body that would have been separated along a longitudinal plane that follows the cavity of the valve. The portions of the valve body may be sealed together by a mechanical seal or supplemented by additional sealing means such as gaskets, glues, epoxies, welding, clamps, bands, screws, or bolts. The portions of the valve body may also use pins or other means of guiding and assuring a proper assembly of the valve body portions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In addition to the novel features and advantages mentioned above, other objects and advantages of the present invention will be readily apparent from the following descriptions of the drawings and preferred embodiments.

[0015] **Figure 1** is a perspective view of an exploded version of an embodiment of the present invention.

[0016] **Figure 2** is a top elevational view of a gate and sealing gasket of an embodiment of the present invention.

[0017] **Figure 3a** is a top elevational view of a gate and a portion of a cavity a valve body of an embodiment of the present invention.

[0018] **Figure 3b** is a top elevational view of a gate and a portion of a cavity a valve body of an embodiment of the present invention

[0019] **Figure 4** is a side elevational view of an embodiment of the present invention.

[0020] **Figure 4a** is a cross-sectional view of a valve body of an embodiment of the present invention showing an exemplary aperture.

[0021] **Figure 5a** is a top elevational view of a gate and gasket of an embodiment of the present invention.

[0022] **Figure 5b** is a top elevational view of a gasket of an embodiment of the present invention.

[0023] **Figure 5c** is a top elevational view of a gasket of an embodiment of the present invention.

[0024] **Figure 5d** is a top elevational view of a gasket of an embodiment of the present invention.

[0025] **Figure 6a** is a top elevational view of a gasket of an embodiment of the present invention.

[0026] **Figure 6b** is a top elevational view of a gate of an embodiment of the present invention.

[0027] **Figure 6c** is a top cross-sectional view of a valve body of an embodiment of the present invention showing an exemplary cavity.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT(S)

[0028] The exemplary embodiments discussed below are preferably made from a plastic material. Preferred embodiments of at least portions of the present invention may be manufactured via an injection molded plastic process. In addition to plastic, at least portions of the present invention may be made from other similar material including plastic-containing compounds. At least portions of the present invention may be manufactured from metals, such as aluminum, copper, or steel. In addition, portions of the present invention may be manufactured from materials comprising: neoprene, rubber, isoprene, Teflon ®, nitrile, silicone, fluoroelastomer such as Viton ®, EPDM, EPM, styrene-butadiene, butyl, and CSM such as Hypalon ® elastomer. Other suitable materials for use in the manufacture of alternative embodiments include those materials well known in the art for piping and plumbing components.

[0029] An exemplary embodiment of a valve of the present invention is shown in an exploded view at **Figure 1**. A first portion **10** and a second portion **20** of a valve body are shown with an embodiment of a gate **30** of the present invention. An inlet **12** to the valve is shown as an exemplary receptacle for a glued connection with a pipe (not shown). Alternatively, an outlet **22** of the valve is shown having an exemplary plumbing connection such as may be associated with a compression fitting. As noted previously, exemplary pipe connections for the inlet and outlet of the valve include, but are not limited to: mechanical connections, threaded connections, sockets, Victaulic ®, flanges, welded connections, glued connections, compression fittings, banded connections, swaged flangeless connections, hydraulic connections, and other plumbing connections.

[0030] The second portion **20** of the valve body shows a cavity **24** extending longitudinally through at least a portion of the valve body. The cavity **24** shows the outlet **22** of the valve as being in fluid communication via a passage that is comprised of the opening shown at **26**. Although it is hidden on this view of the first portion **10** of the valve body, the passage is generally aligned between the inlet **12** and the outlet **22** so that a flow of fluid through the valve is generally transverse to the longitudinal extension of the cavity **24**. In addition, with respect to the conduit portion **32** of the gate **30**, the assembled valve is intended to provide a passage for flow of a fluid through the valve when the conduit portion **32** of the gate **30** is aligned with the inlet **12** and outlet **22** of the valve. The aligned relationship between the conduit portion **32** and the inlet **12** and the outlet **22** is associated with the valve being in an open position. Alternatively, a passage for flow through the valve is interrupted and thusly described as being in a

closed position when the blocking portion **34** is generally aligned with the inlet **12** and outlet **22** of the valve.

[0031] The gate **30** is shown as having a generally complementary shape that is slidably moveable along the longitudinal length of the cavity **24**. In addition, the gate **30** is shown having a first post **36** and a second post **37** connected to opposite ends of the gate **30**. The posts, **36** and **37**, provide for the operative movement of the gate **30** within the cavity **24** when the posts are moved. The posts, **36** and **37**, may be the same size and/or shape. In addition, the post **36** may alternatively have a different size than post **37**, such as might be associated with a different outside diameter. Another alternative embodiment of the present invention provides for the post **36** having a different cross-sectional shape than post **37**. The distinguishably shaped or sized posts would have a complementary fit with their respective openings in the valve body as shown in the vicinity of the ends of the cavity **24** at **25** and **27**. Either alternative embodiment with respect to the posts provides for assistance in assuring a properly assembled valve.

[0032] At least one sealing gasket provides a seal between the gate **30** and the cavity **24**. Alternative embodiments of sealing gaskets are shown in subsequent figures. As shown on the gate **30**, a groove **38** is adapted to receive at least a portion of the sealing gasket. In this manner, the groove **38** can facilitate the use of the sealing gasket to maintain a seal between a surface of the gate **30**, such as is shown at **39**, and a surface of the cavity **24**, such as shown at **28**. As shown in **Figure 1**, a sealing gasket in the groove **38** of the surface **39** of the gate **30** would effect a seal against the surface

28 of the cavity **24** only if the gate was rotated 180° such that the surfaces **39** and **28** were in a face-to-face relationship.

[0033] As can be seen with the shape of the groove **38**, an exemplary sealing gasket of the present invention that has a complementary fit with the groove **38** would provide a portion of the sealing gasket that extends around a perimeter of the conduit portion at **32** and a portion that extends around a perimeter of the blocking portion at **34** of the gate.

[0034] **Figure 2** shows an embodiment of the gate of the present invention at **40**. As described previously, the gate **40** has posts **41** and **42**. In addition, gate **40** is provided with end caps **43** and **44** that may assist with operation of the valve by providing a comfortable place for the contact and operation of a valve by an operator. In addition, the posts, **41** and **42**, or the end caps, **43** and **44**, may be marked and/or colored so as to indicate a gate position on an assembled valve. For example, a post or end cap may be colored green or red as an indicator of an open valve or a closed valve, respectively.

[0035] **Figure 2** shows an embodiment of a sealing gasket **50** of the present invention. As shown, the sealing gasket **50** is comprised of a circular portion **51**, a first straight portion **52** connected to the circular portion **51**, a second straight portion **53** connected to the circular portion **51**, and a substantially semicircular portion **54** having a first end **55** and a second end **56**. In this embodiment, the straight portions, **52** and **53**, are tangential to the circular portion at their respective connections to the circular portion **51**; in addition, the two straight portions, **52** and **53**, are parallel. Additionally, the ends of the two straight portions, **52** and **53**, are each connected to an end of the

substantially semicircular portion **54**, such as is shown at **55** or **56**. It should be noted that although the present embodiment of the sealing gasket shows the circular portion **51** providing a seal around the perimeter of the blocking portion **45** of the gate **40**, alternative embodiments of the present invention provide for a circular portion to provide a seal around the conduit portion **46** of the gate by extending around its respective perimeter.

[0036] **Figures 3a** and **3b** show the slidable movement of a gate **60** within a cavity **61** of a valve body. In particular, **Figure 3a** shows the general alignment of the blocking portion **62** with the passage **63** for fluid through the valve. In this position, the valve would be in a closed condition. As shown at **Figure 3b**, the general alignment of the conduit portion **64** with the passage **63** for fluid through the valve places the valve in an open condition.

[0037] **Figure 4** shows an alternative embodiment of a valve of the present invention. **Figure 4a** shows a cross-sectional view of the valve, particularly to illustrate an exemplary aperture **65**. As described previously, the aperture **65** may be accessible by removal of a cap **66**. The aperture **65** extends into the cavity of the valve, allowing for the slidable assembly a gate into the cavity. The aperture **65** is sealed by the cap **66** after insertion of a gate into the cavity. In addition, an opening in the valve body **67** and an opening in the cap each provide a complementary fit for their respective posts, e.g. **68**, of a gate. As discussed previously, the openings and the posts may be distinguished by different shape and/or size.

[0038] **Figure 5a** shows an alternative embodiment of the gate **70** and a pair of sealing gaskets at **71** and **72**. In addition, the gate **70** is shown as having posts **73** and

74. As shown in the present embodiment, the sealing gaskets **71** and **72** may be described as a pair of concentric o-rings. In this embodiment, one sealing gasket **71** would provide a seal between the cavity of the valve body and the perimeter of the blocking portion **75** of the gate **70**. The second sealing gasket **72** would provide a seal between the cavity of the valve body and a perimeter surrounding the blocking portion **75** and the conduit portion **76** of the gate **70**. In this manner, an unintended release of fluid from the valve of the present invention is discouraged, even as the position of the gate is slidably moved in the cavity between an open position and a closed position.

[0039] **Figures 5b**, **5c**, **5d**, and **6a** show alternative embodiments of the sealing gasket of the present invention. As described previously, the sealing gasket may be comprised of circular portions, semicircular portions, curved portions, or straight portions.

[0040] **Figure 6b** shows a gate **80** of an embodiment of the present invention. The gate is shown with posts, **81** and **82**, a conduit portion **83**, and a blocking portion **84**. Notably, the present embodiment of the gate does not have a groove adapted to receive a sealing gasket. Instead, as shown in **Figure 6c**, a portion of a valve body is illustrated to show a cavity **85**. As can be observed in the present embodiment, the cavity **85** has openings, **86** and **87**, in the vicinity of the ends of the cavity and a sealing gasket **88** is shown in a surface **89** of the cavity **85**. As a result, a seal is provided by the sealing gasket **88** between a surface of the gate **80** and a surface **89** in the cavity. As described previously, the sealing gasket allows for the slidable movement of the gate **80** while still maintaining a seal and discouraging an unintended release of a fluid. In addition, the surface **89** may be comprised of a groove to receive the sealing gasket **88**.

[0041] The preferred embodiments herein disclosed are not intended to be exhaustive or to unnecessarily limit the scope of the invention. The preferred embodiments were chosen and described in order to explain the principles of the present invention so that others skilled in the art may practice the invention. Having shown and described preferred embodiments of the present invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention. Many of those variations and modifications will provide the same result and fall within the spirit of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.